ABSTRACT
The researches in the production field of the reasonable biomaterials with textile structures have the following main objectives; the ensuring of the biological characteristics and especially of the biocompatibility of the products depending on the category they belongs to (implant or medical article for external use). Originally, surgical masks were designed to minimize the risk of wound infection for surgical patients by preventing the spread of microorganisms expelled from the nose and mouth of operating room personnel. Today, confronted with the challenges of new and drug-resistant pathogens, surgical masks are used in the preoperative practice setting to protect health care workers from a variety of potential blood borne and inhalation hazards. The level of protection needed should be a primary consideration in the selection and use of surgical masks; the appropriate level of protection will vary based on the clinical application. In some clinical situations, high filtration efficiency might be important; in other uses, high fluid resistance might be needed. The paper presents the various types of masks demonstrate how different levels of protection are appropriate for different clinical applications. Finally, criteria for appropriate selection and use of facial protections devices will be outlined.

Keywords: Biocompability, Filtration efficiency, surgical mask
1. INTRODUCTION

For over a century it has become of the utmost importance to keep operating rooms and (Russell, S.J., 2007; Huang J.T. and Huang V.J., 2007) operating personal as sterile as possible to ensure the least possible chance of a patient acquiring a surgical site infection, thus leading to longer hospital stay and elevated costs of caring for said patient. It has been suggested that patients that obtain a surgical site infection require an extra 6.5 day hospital stay and their hospital costs are doubled. The origins of the surgical masks are based on the theory that wounds can become infected by bacteria in droplet from hospital staff in the operating room.

It is essentially an automatic reflex that one puts on a surgical mask when entering the operating room (Yinge Qian et al. 1998) However, it has been questioned whether this is necessary for the safety of both patient and hospital staff, and simply an unnecessary tradition from bygone eras. More recently, it has come to be accepted that surgical masks also protect hospital staff splashes of potentially infected bodily fluid to the lower face. Surgical masks were developed to contain and filter droplets of micro-organisms expelled from the mouth and nasopharynx of healthcare workers during surgery, thereby providing protection for the patient. However there are several ways in which surgical masks could potentially contribute to contamination of the surgical wound. Surgical masks have recently been advocated as a protective barrier between the surgical team and the patient, but the role of the surgical mask as an effective measure in preventing surgical wound infection is questionable.

1.1. Different types of Surgical Masks

A surgical mask is a loose-fitting, disposable device that creates a physical barrier between the mouth and nose of the wearer and potential infectious contaminants in the immediate environment (Yinge Qian et al. 1998). These masks are constructed in various thicknesses and with different abilities to protect the wearer from contact with liquids and in some cases, airborne particulates. These properties may also affect how easily the wearer can breathe through the surgical mask and also how well the surgical mask protects the wearer (Shu-Kang Chen et al. 1994). The design and construction of surgical masks will be reviewed later in this study guide. Today, because surgical masks are used in a wide range of hospital and health care settings and are intended for various applications and levels of protection, there are a number of options available. In general, there are three basic categories of surgical masks, based upon their intended use and their donning mechanism: flat masks, specialty masks, and N95 respirators.

Specialty masks are high-filtration masks designed for specific surgical procedures, such as procedures involving the use of lasers and electrosurgical devices (during which smoke plume is generated) and other procedures using powered equipment that generate airborne particulates.

These masks are constructed with an advanced filter that blocks plume particles as small as 0.1 micron. Surgical masks may not filter chemical contaminants, therefore OR personnel should consult the facility’s policy to ensure they are using the correct mask for the procedure. Fluid resistant masks can also be categorized as specialty masks (Terry M. Haber and Romeo LeMarie, 1988). Another type of specialty mask is the cone mask. This type of mask is often selected, as it is economical, fluid resistant, easy to don (with an elastic, adjustable head strap and nosepiece) and is often perceived to be more comfortable than a typical flat mask.

1.2. Components of surgical mask

Facial protection devices are constructed of various materials in four multiple layers: inner; middle (filtering – which is designed to trap particulate matter away from the wearer’s face - and non-filtering); and outer (Shu-Kang Chen et al. 1994; Terry M. Haber and Romeo LeMarie, 1988; Leonard W. Glass, 2002). The types of fabrics used in facial protection devices typically include polypropylene, either spunbonded, meltblown, or wetlaid; and other materials such as metals, for example, used in nose features; colorants; elastic materials, e.g., used in devices with ear loops; foam and other anti-fog 13 materials; and face shield materials. While two surgical masks may be generally similar in their construction, for example, each consisting of four layers of material, the same type of donning mechanism, and a nose wire, they may be distinctly different in their feel and performance (Kevin K. Brunson and Albert R. Rich, 2000).

Facial protection devices are generally composed of nonwoven fabrics, which are engineered materials that are bonded together by mechanical, thermal, or chemical means. Nonwoven fabrics are made directly from natural or plastic fibres or plastic film. Nonwoven fabrics have single use and multiple use applications, all face masks, with the exception of N95 respirators, are intended for single use only.

1.3. Different types of masks for different purpose/task

a) N95

Maximum filtration

Chinta et al.
Types of Surgical mask: A perspective,
Indian Journal of Science, 2014, 10(23), 7-9,
http://www.discovery.org.in/ij.htm
High fluid resistance - 160mmhg  
Filtration efficiency - PFE= 99.9%@0.1 micron  
Breathability - Delta P ≥ 5.0 mmH2O/cm²  
Use: Indicated to use when treating patients with airborne diseases such as TB or influenza

b) ASTM level 3  
High fluid resistance - 160mmhg  
Filtration efficiency - BFE>98%  
PFE>98%@0.1micron  
Breathability - Delta P ≤ 5.0 mmH2O/cm²  
Use: Ideal for procedures where heavy to moderate amounts of fluid, spray and or aerosols are produced

c) ASTM level 2  
Moderate fluid resistance - 120mmhg  
Filtration efficiency - BFE>98%  
PFE>98%@0.1micron  
Breathability - Delta P ≤ 5.0 mmH2O/cm²  
Use: Ideal for procedures where moderate to light amounts of fluid, spray and or aerosols are produced

d) ASTM level 1  
Low fluid resistance - 80mmhg  
Filtration efficiency - BFE>95%  
PFE>95%@0.1micron  
Breathability - Delta P ≤ 5.0 mmH2O/cm²  
Use: Ideal for procedures where low amounts of fluid, spray and or aerosols are produced

2. CONCLUSION

It is generally acknowledged that the evidence to support the continued use of masks is limited yet most guidelines for dress codes continue to recommend their use (Romney. M. G, 2001). More research must be undertaken before a definite conclusion can be made, care must be taken to ensure properly designed studies that determine if surgical masks prevent wound infections post surgery. It has been shown that not wearing a mask does not increase the rate of post surgical infection rates. Additionally, the use of the mask as protective equipment for hospital staff should be investigated before deciding to eliminate masks from operating rooms.

REFERENCE